

Syncing with RPKI: Exploring Causes of Delay in Relying Party Synchronization

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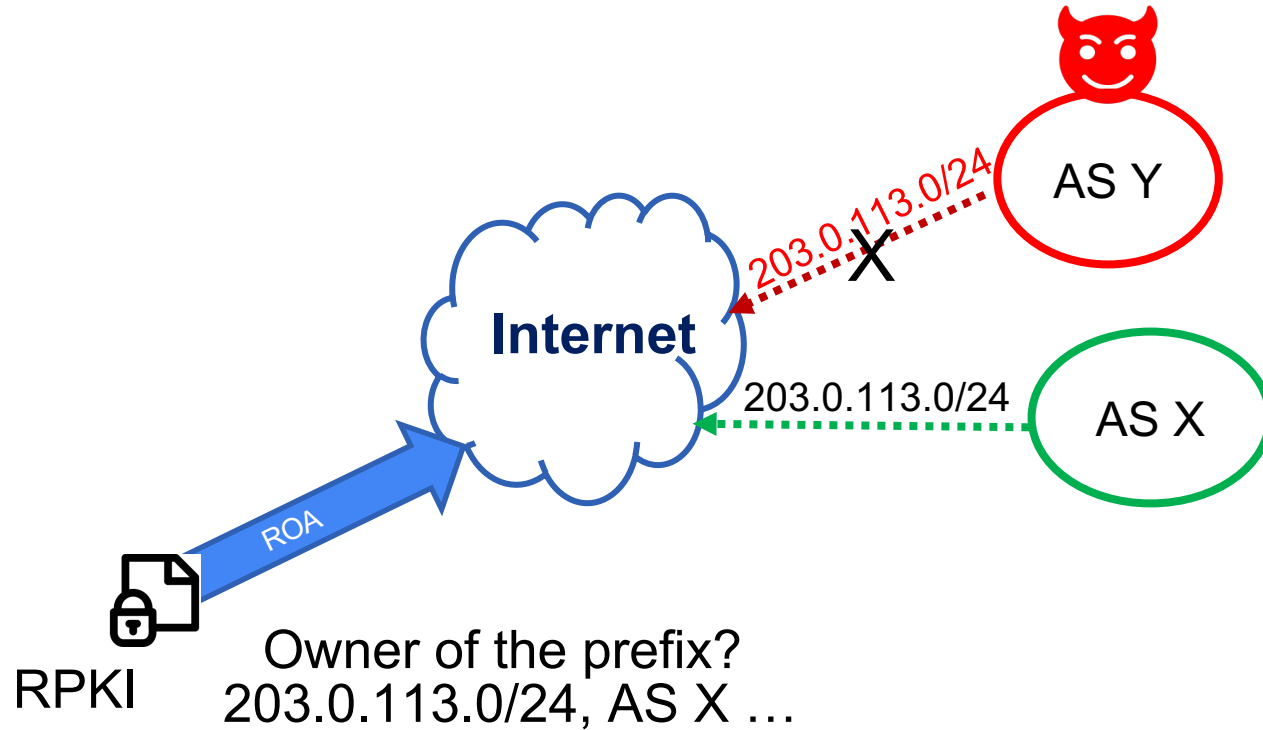
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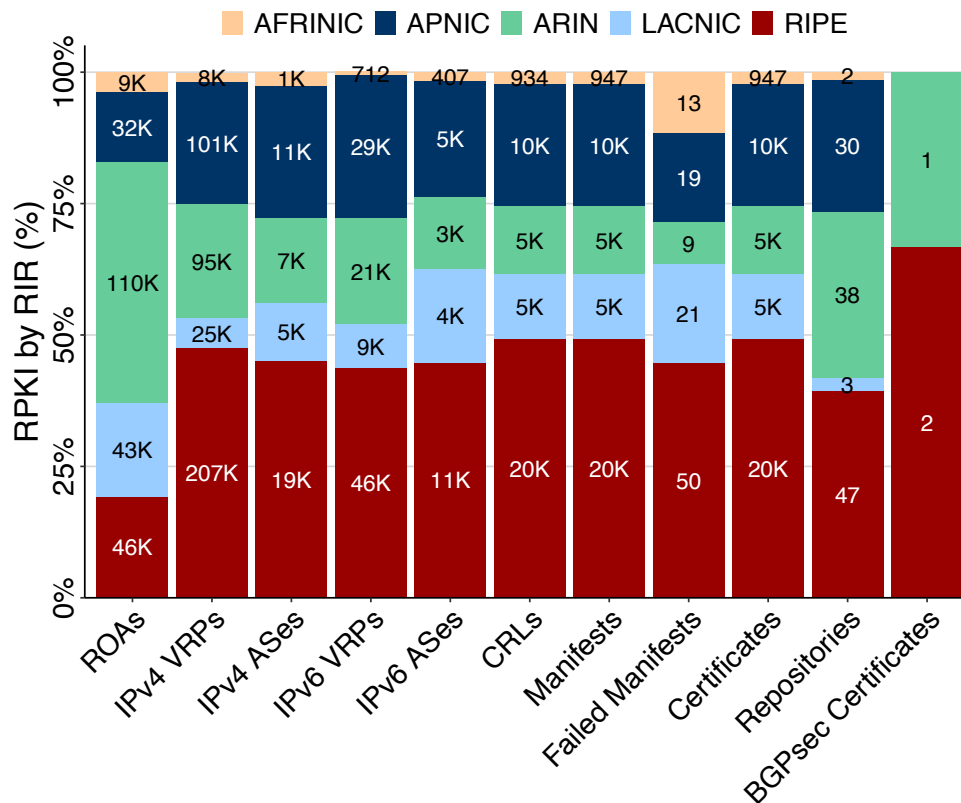


Resource Public Key Infrastructure (RPKI)



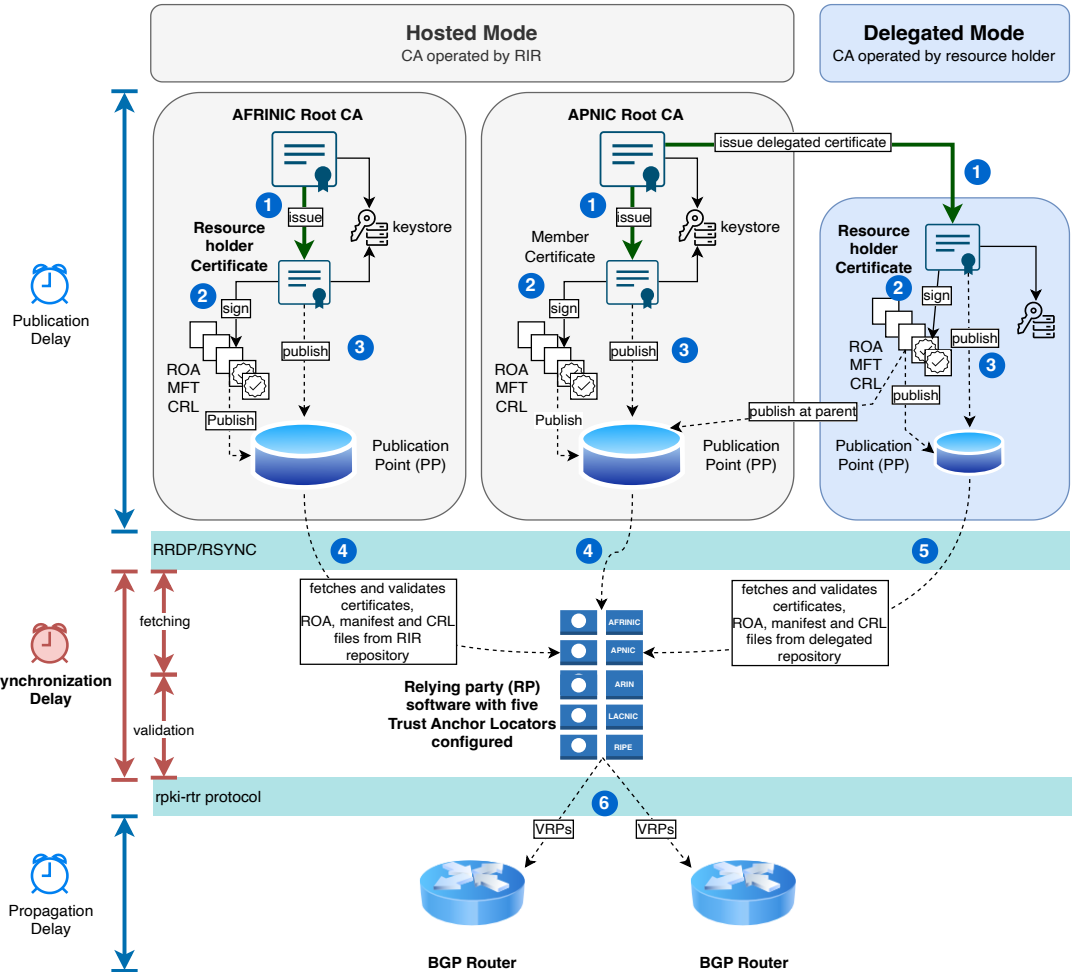
RPKI Data

550K (542K unique) VRPs



Time in RPKI

Our focus



Motivation

1. If RPKI and BGP go out of sync, traffic can be dropped and services impacted
2. RPKI continues to grow and new objects like ASPA are added

1. ANALYZING RELYING PARTY SYNCHRONIZATION DELAY

Experimental Setup

VM in Japan



Validation modes: Online, Offline, Cache

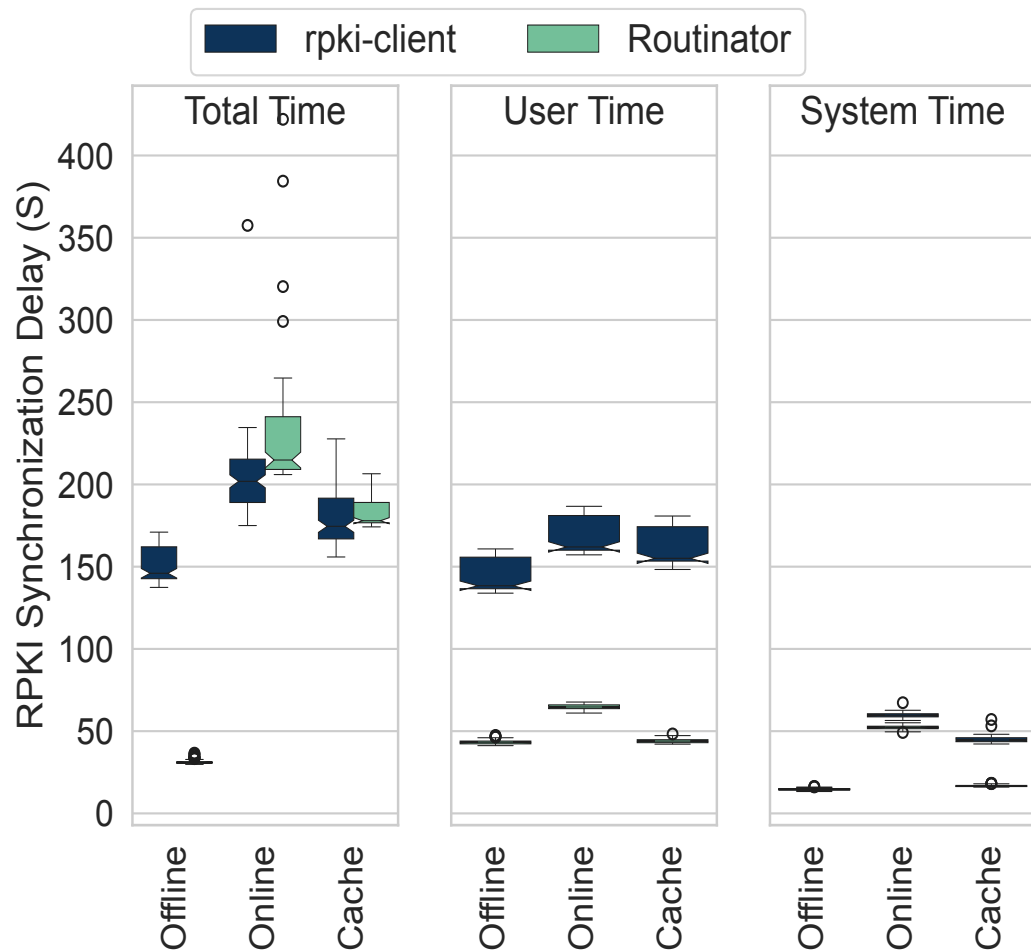
For each of the Trust Anchors (TAs)
Certificate chain depth

More than 3000 experiments of RPKI synchronization
Every 2 hours, for 10 consecutive days

RPKI Validation Time

Online mode has the highest Total Time

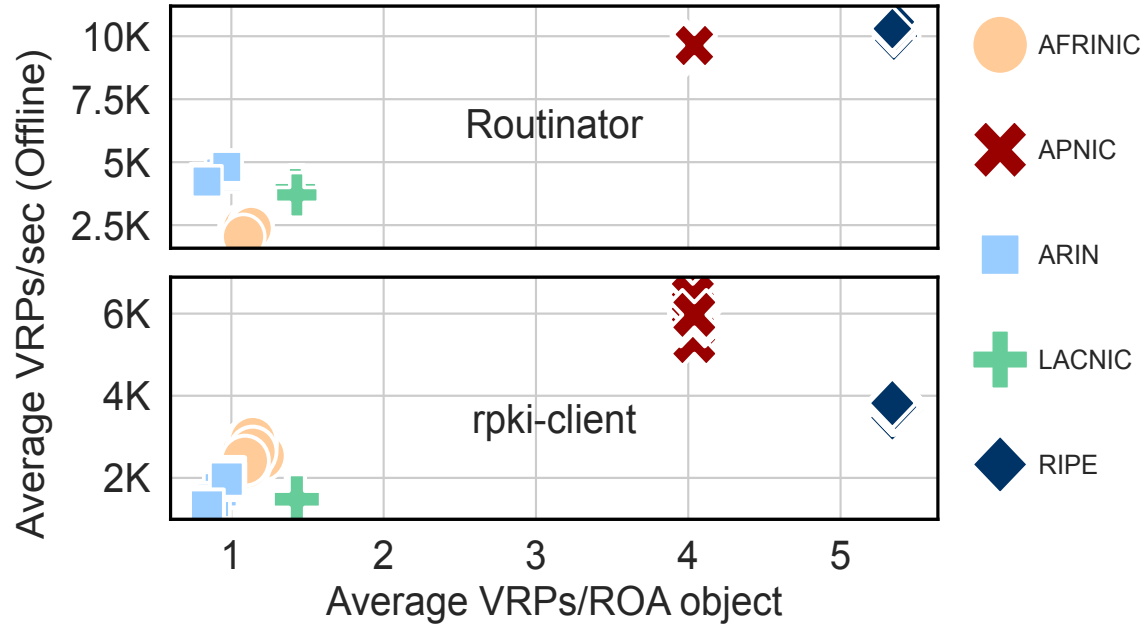
Routinator: fetching data
rpki-client: process ROAs



Validation Time Discrepancies Among TAs

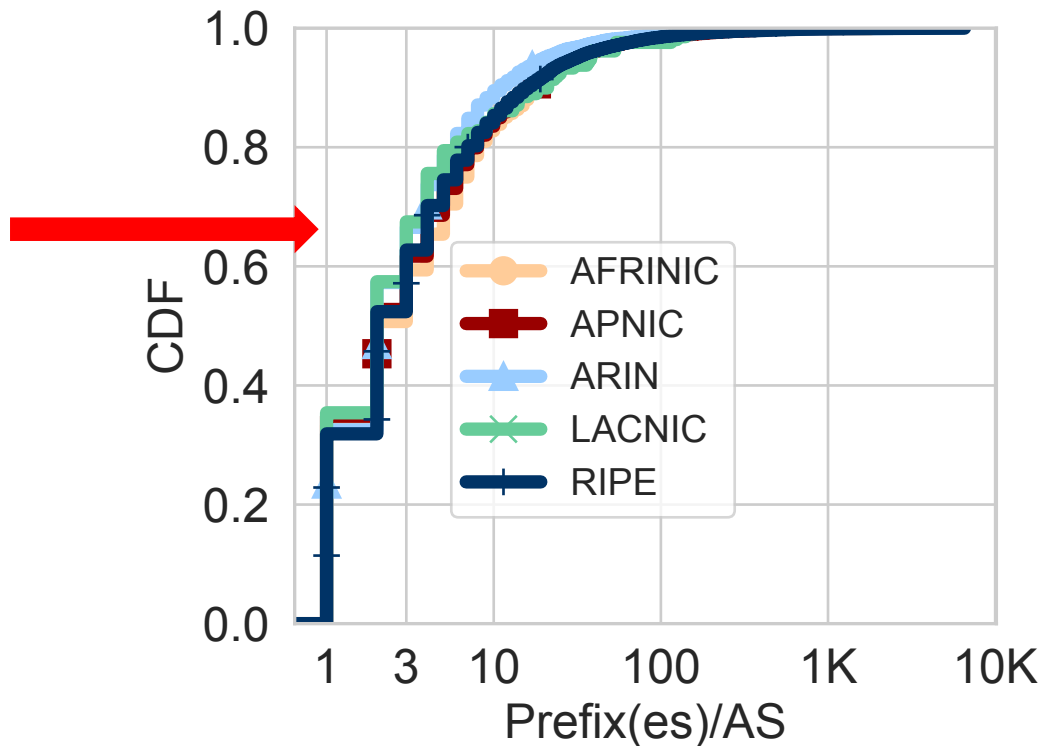
VRPs from AFRINIC, ARIN, and LACNIC TAs take up to thrice more time to process than the APNIC and RIPE VRPs.

Bundling prefixes of an AS -> single ROA



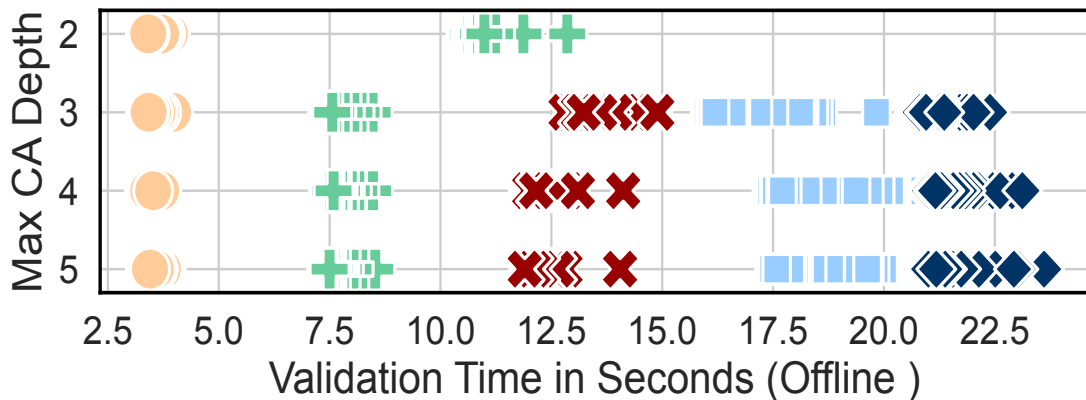
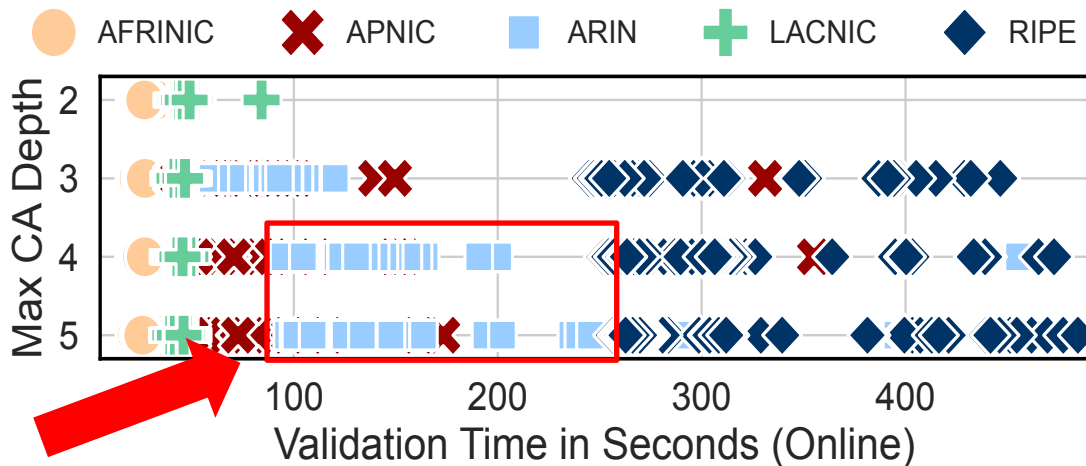
Potential of Bundling Prefixes into a Single ROA

Around 65% of ASes have more than one IP prefix in RPKI



Impact of Certificate Chain Depth

10% of VRPs in delegated CA, cause up to 50% more delay for ARIN TA



2. MEASURING RPKI PUBLICATION POINTS(PP) DELAY WORLDWIDE

Delay Measurements to Publication Points (PPs)

700 RIPE Atlas anchors from 91

TCP based Traceroute to RPKI PP hostnames

- RRDP (port 443)
- Rsync (port 9981)

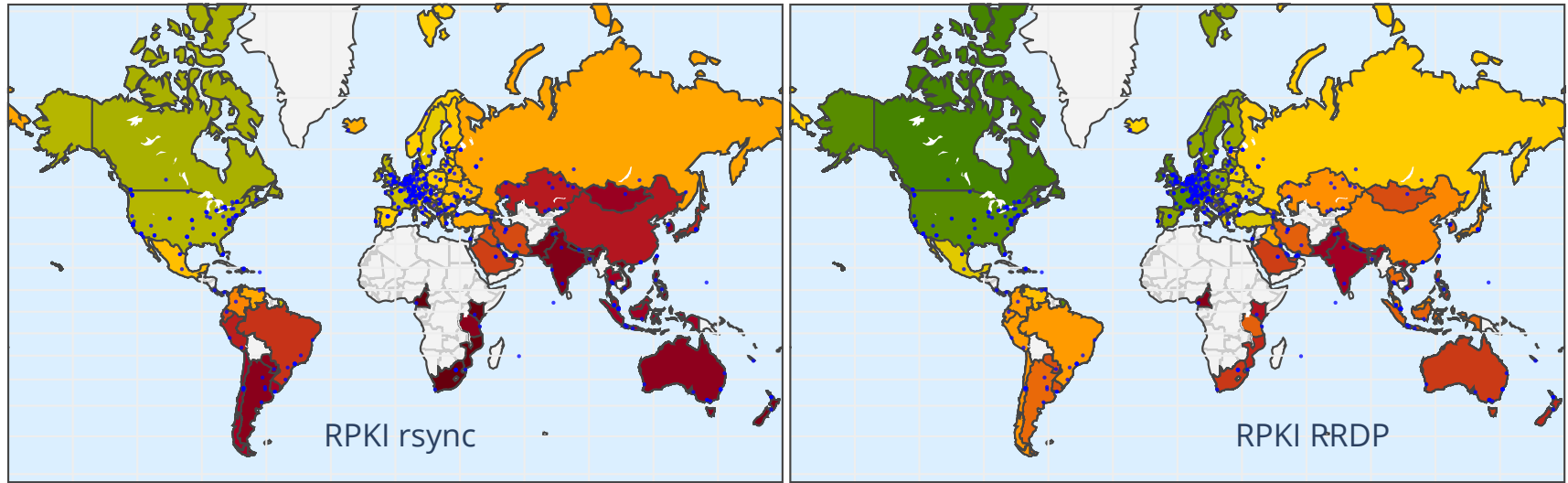
Using IPv4 and IPv6

Two weeks, every 5 hours



7 Million Packets

PP Accessing Delay Across Countries



RTT(MS)



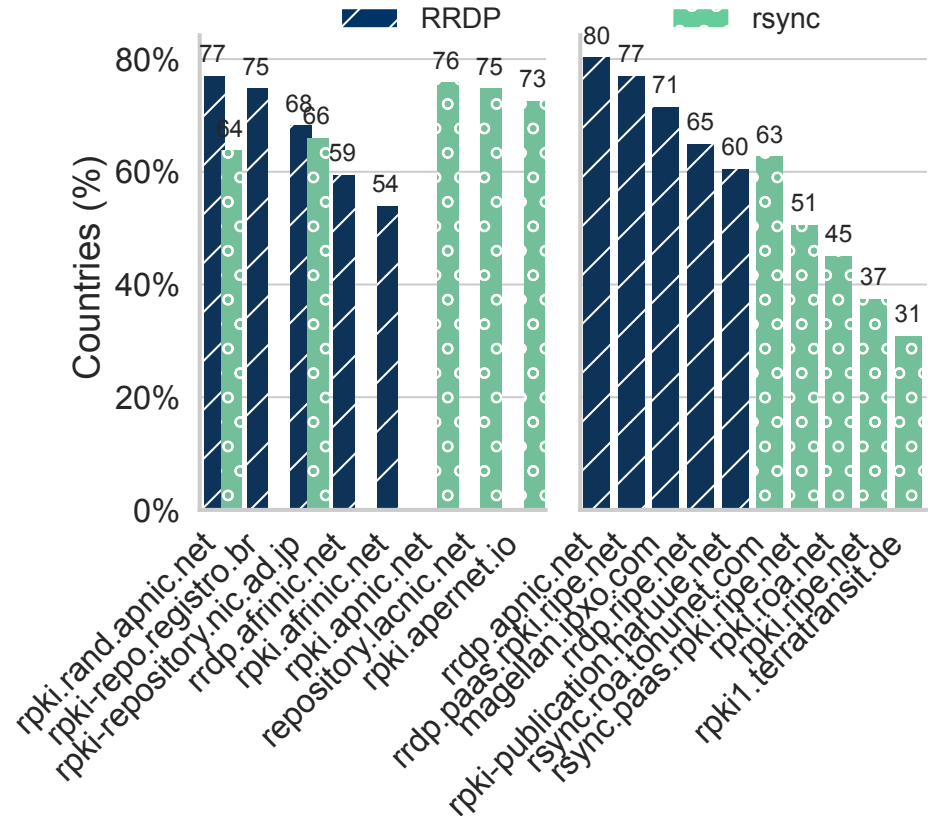
Fastest and Slowest PPs Worldwide

Slow PPs

- 4 Delegated
- 4 Hosted (2x AFRINIC, RIPE, LACNIC)

Fast PPs

- 5 Delegated
- 4x RIPE, APNIC



(A).Slowest PPs

(B).Fastest PPs

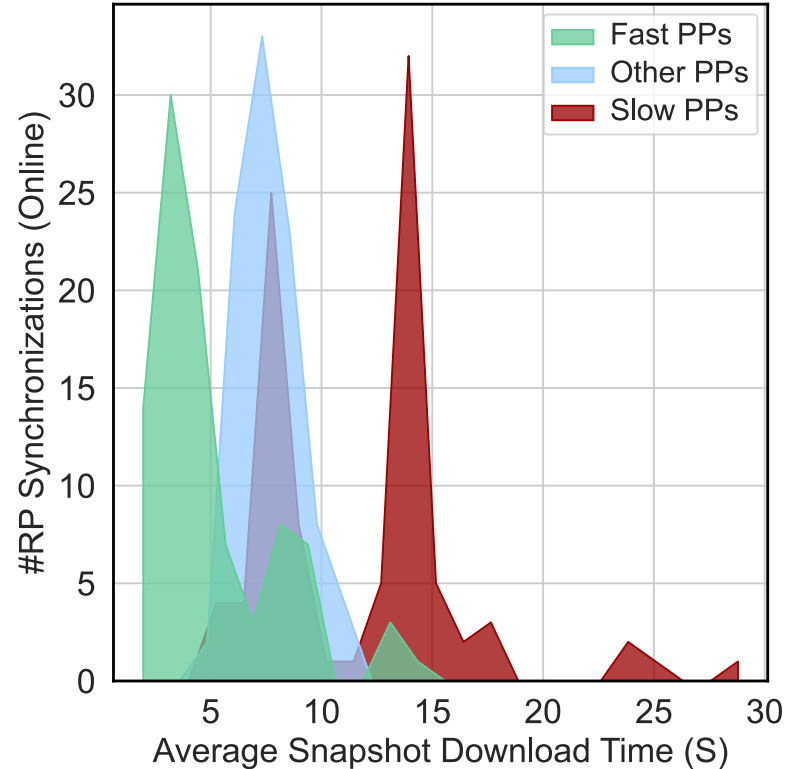
Impact of PP Delay on RPKI Synchronization

Slow PPs (red) Snapshot download takes 6-18 seconds

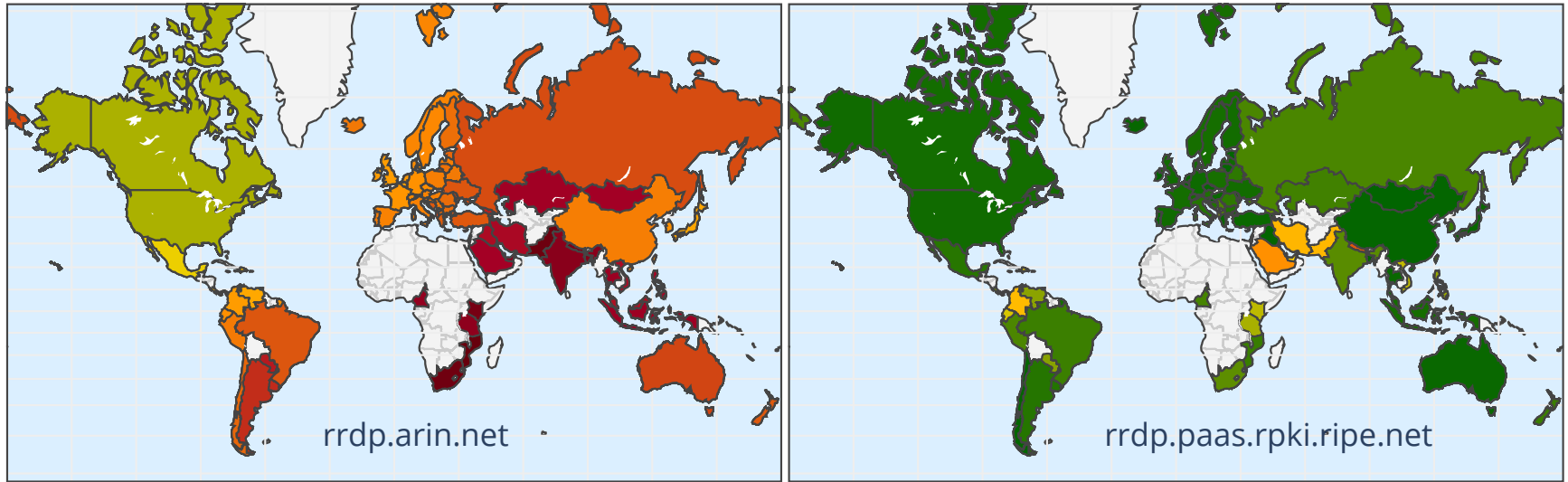
Fast PPs (green) < 5 second

Slow PPs ~ 1/5th of Fast PP data

Few ROAs take long time



The Help of CDNs



Thank you!